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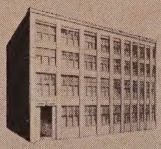

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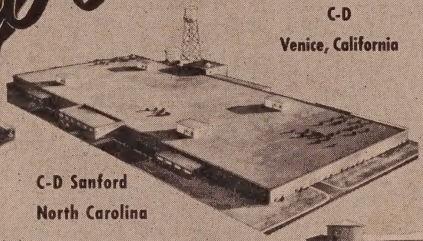

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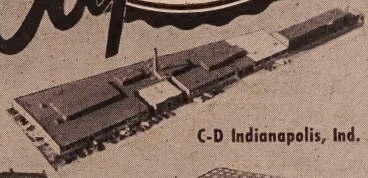

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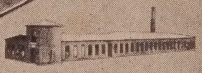

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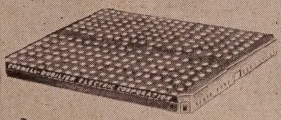

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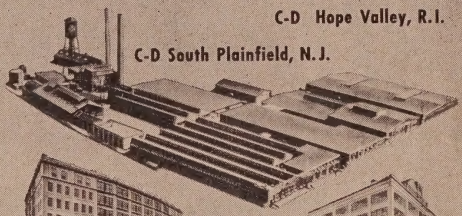

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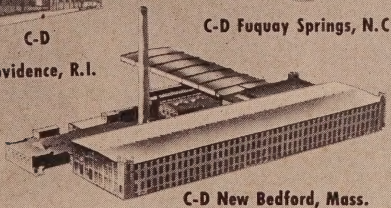

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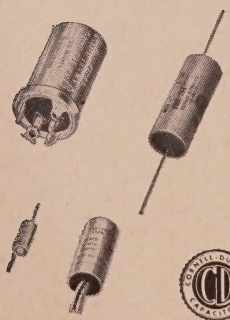

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PEAK VOLTAGES IN RECTIFIER CIRCUITS

An understanding of the magnitude and location of peak voltages in rectifier circuits is an aid to reliable operation, since it enables the designer of power supplies to forestall breakdown and gives the servicer of this equipment a working knowledge of safe ratings which replacement components must have.

The two potentials of chief interest are **peak forward voltage** and **peak inverse voltage.** We have borrowed the term "forward" from semiconductor nomenclature to designate the applied voltage when the rectifier, whether tube or semiconductor, is conducting current. The inverse voltage is evidenced during the negative half-cycle of applied voltage when the rectifier is not conducting. Also of significance are the peak voltages developed across capacitors, chokes, and resistors in the circuit.

The values of the peak voltages are related to the rms value of the applied voltage but also depend upon the rectifier circuit configuration (i.e., whether single-phase, polyphase, half-wave, full-wave, etc.), amount of loading, and type of load (i.e., whether resistive, capacitive, or inductive.)

Nature of Forward and Inverse Voltages

Figures 1 and 2 serve to illustrate the basic relationship between voltages in a simple single-phase, half-wave rectifier circuit. Figure 1 applies to capacitive loading, and Figure 2 to resistive loading. Diode V is a vacuum-tube rectifier. A-C voltage (E_1) is supplied by L (the secondary winding of a transformer) or by direct connection to the a-c power line.

In Figure 1, it is assumed that capacitance C is large and/or the output loading is extremely light so that the capacitor loses only a negligible amount of its charge between the nonconducting half-cycles of applied voltage. The d-c voltage, E_2, thus is substantially constant across the capacitor.

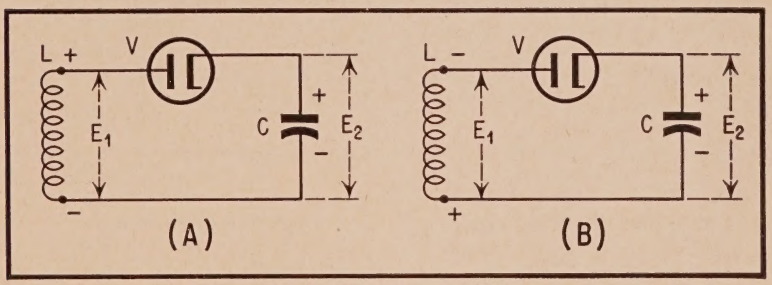

Fig. 1. Capacitive Loading.

When the plate of the tube is positive, as in Figure 1(A), V conducts and charges capacitor C to a voltage equal to the peak value of E_1 minus the small voltage drop across the tube. Thus, E_2 is approximately equal to $1.414E_1$, where E_1 is the rms value of the applied voltage. Capacitor C, which is comparable to the input capacitor of a capacitor-input type of

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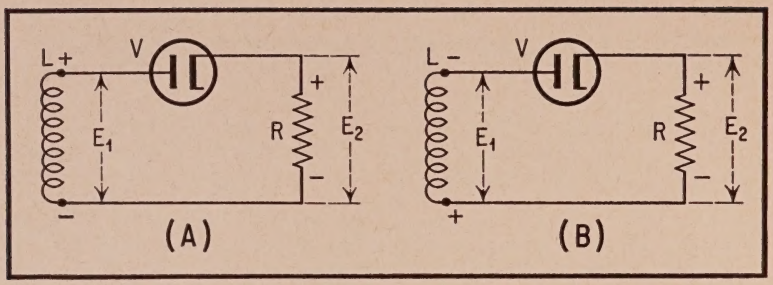


Fig. 2. Resistive Loading.

filter, accordingly must be rated to withstand this peak voltage safely.

When the input cycle reverses, the plate of the tube is negative, as in Figure 1(B). The tube cannot conduct under these circumstances. However, Capacitor C remains charged to a voltage E_2 (equal to E_1 peak) during most of this half-cycle. Now, the lower terminal of L is positive and is connected in series with the negative terminal of C. Consequently, during the negative half-cycle, the peak value of E_1 is added to E_2 and this total voltage (equal to $2E_1$ peak) is applied between the cathode (+) and plate (−) of the tube. The peak inverse voltage thus is twice the peak value of the applied a-c voltage (or 2.82 x E_1 rms) and the tube must be able to withstand this voltage between its elements when non-conducting.

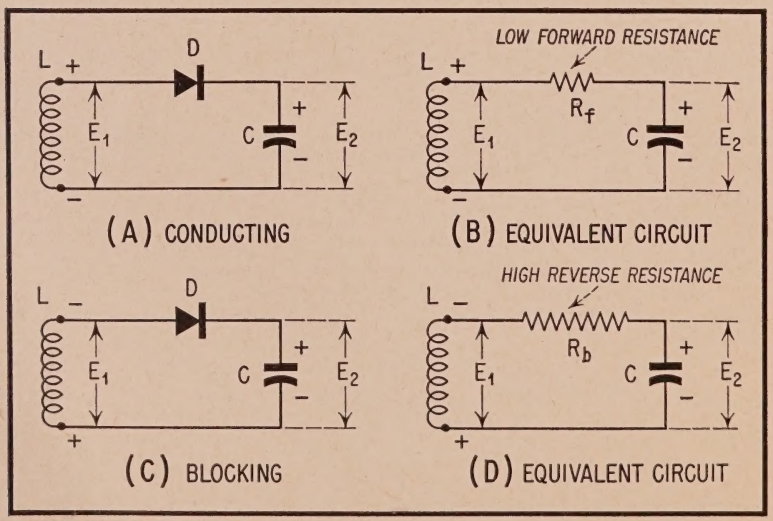


Fig. 3. Semiconductor Rectifier, Capacitive Load.

In Figure 2, the load device is a resistor. When the plate of Tube V is positive, as in Figure 2(A), the tube conducts, passing a current (I) through the resistance. The d-c output voltage, E_2, is equal to IR minus the voltage drop across the tube. Because this is a half-wave rectifier, the d-c voltage consists of a series of half-sinusoids each separated from the other by a period equal to ½ cycle. When the input cycle reverses, the plate of V becomes negative and the tube cannot conduct. The current flow is interrupted and there accordingly is no voltage drop across Resistor R. Because of this, the cathode of Tube V is at the same positive potential as the lower terminal of the winding, L. In this instance, the peak inverse voltage across the tube is equal to the peak value of E_1 (i.e., to 1.414 x E_1 rms). From this, it is seen that a half-wave rectifier tube with resistive load is called upon to withstand only one-half the peak inverse voltage it must withstand with capacitive loading.

When semiconductor rectifiers are employed, the situation is altered somewhat by the fact that these rectifiers, unlike the diode tube, do not completely block during negative half-cycles of applied voltage. Figures 3 and 4 show illustrative single-phase, half-wave rectifiers of this type.

In Figure 3(A), Rectifier D conducts when the upper terminal of Winding L and the rectifier anode are positive. Capacitor C then is charged to the peak value of E_1 minus the voltage drop across the rectifier. Figure 3(B) shows the equivalent circuit in which R_f is the forward resistance of the rectifier.

When the input cycle reverses, the anode of the rectifier becomes negative, as shown in Figure 3(C). However, by its nature, the rectifier does not completely block in this situation

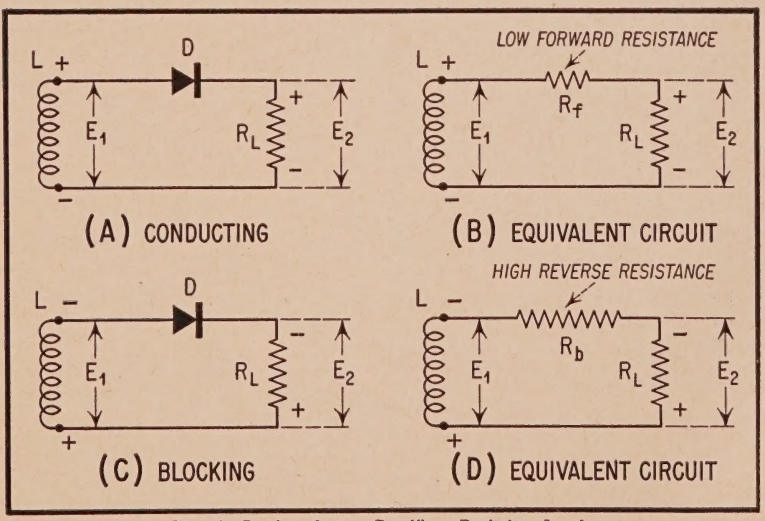


Fig. 4. Semiconductor Rectifier, Resistive Load.

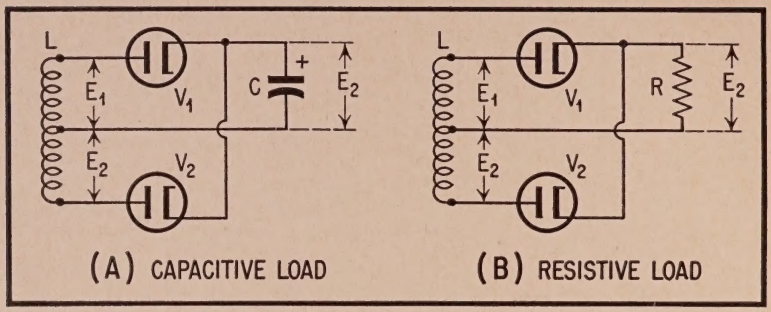


Fig. 5. Single-Phase, Full-Wave Circuits.

but passes a small reverse current (I_b) through its reverse resistance (R_b in the equivalent circuit Figure 3D). The peak inverse voltage across the rectifier thus is somewhat less than the sum of E_2+E_1 peak, because of the voltage drop I_bR_b. In modern silicon power rectifiers, R_b is quite high so that the peak inverse voltage closely approaches E_2+E_1 peak.

Figure 4 shows the comparable condition when the semiconductor rectifier has resistive loading. In Figure 4(A), the anode of Rectifier D is positive, so that current is passed through Load Resistor R_L to develop the d-c voltage drop, E_2. When R_L is small with respect to the forward resistance, R_f, of a selenium rectifier, the output d-c voltage $E_2 = [E_1+(nE_1/E_p)]/2.3$; where E_1 is the rms value of the applied voltage, E_p the rated peak inverse voltage rating of the rectifier, and n the number of plates in the rectifier stack.

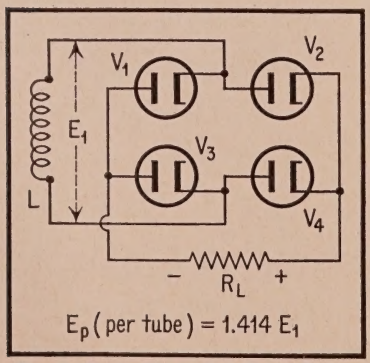


Fig. 6. Single-Phase Full-Wave Bridge.

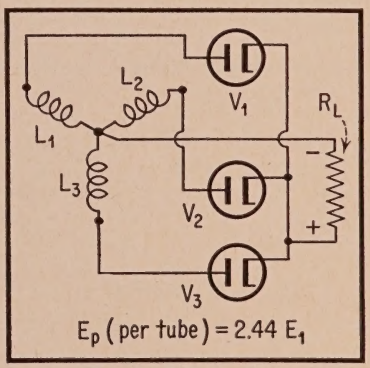


Fig. 7. 3-Phase Star.

When the input cycle reverses, the anode of Rectifier D becomes negative, as in Figure 4(C). Here again, the rectifier does not block completely

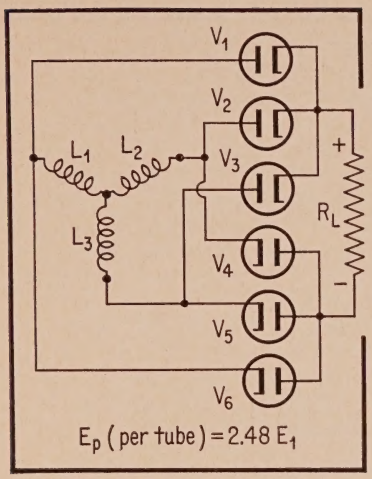


Fig. 8. Six-Phase Single-Y.

but passes a small reverse current, I_b, through its relatively high reverse resistance, R_b. Figure 4(D) shows the equivalent circuit for this condition. This current flow produces a voltage drop across the load resistance, R_L, equal to I_bR_L. The peak inverse voltage across the rectifier thus is somewhat less than the peak value of E_1 because of the voltage drops across R_L and R_b.

Principal Rectifier Circuits

In the single-phase, full-wave rectifier circuit (Figure 5), one rectifier diode conducts during each positive half-cycle of input voltage, E_1. In Figure 5(A), V_1 and V_2 charge Capacitor C to $E_2 = 1.414E_1$ rms minus the tube drop on alternate half-cycles. Voltage E_2 consists of a series of half-sinusoids without intervening gaps. When the plate of V_1 is negative and this tube is not conducting, the approximate peak inverse voltage across V_1 is equal to E_2+E_1 peak. Similarly, when V_2 is non-conducting, its peak inverse voltage is E_2+E_1 peak.

In the resistance-loaded, single-phase, full-wave circuit (Figure 5B),

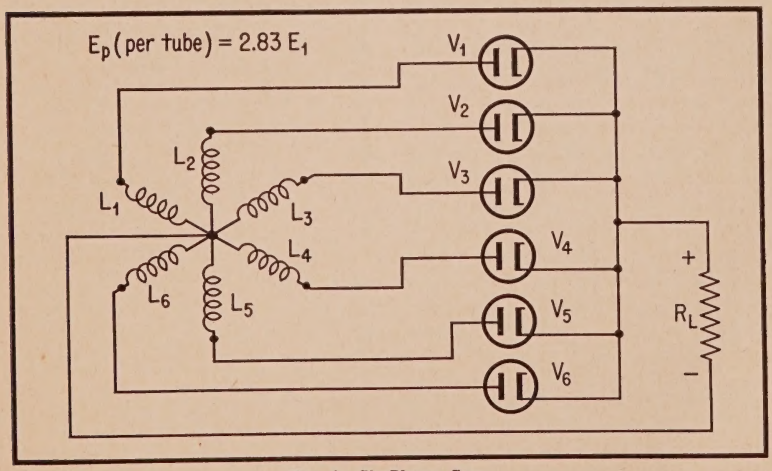


Fig. 9. Six-Phase Star.

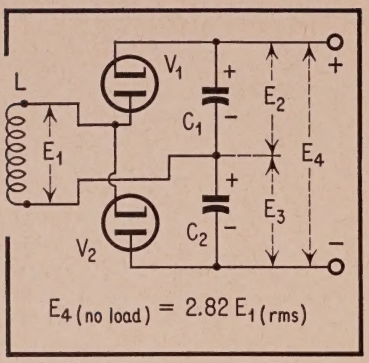


Fig. 10. Voltage Doubler.

V_1 and V_2 conduct on alternate half-cycles, each delivering a half-sinusoid of current to Load Resistor R. The d-c voltage drop, E_2, across Resistor R thus consists of a series of half-sinusoids without intervening gaps. Since the tubes block the negative half-cycles, no current flows through R during these intervals. The peak inverse voltage across each tube thus is equal to the peak value of E_1 (i.e., to 1.414 x E_1 rms).

Several multi-tube rectifier circuits are shown in Figures 6 to 9. In these illustrations, the peak inverse voltage which each tube must withstand is designated E_p, and the rms input voltage (per transformer leg or per phase) as E_1. In the single-phase, full-wave bridge (Figure 6), $E_p = 1.414E_1$. In the 3-phase star circuit (Figure 7), $E_p = 2.44E_1$. In the 6-phase single-Y circuit (Figure 8), $E_p = 2.48E_1$. And in the 6-phase star circuit (Figure 9), $E_p = 2.83E_1$.

Typical Voltage Multiplier Circuits

Figure 10 shows a voltage doubler circuit. In this arrangement, when the upper terminal of the winding, L, is positive, Tube V_1 conducts and charges Capacitor C_1 to a voltage E_2 equal to the peak value of E_1 minus the small voltage drop across V_1. Tube V_2 cannot conduct at this time since its plate is negative. During the opposite half-cycle of applied voltage, the cathode of V_2 is negative and this tube now conducts, charging Capacitor C_2 to a voltage E_3 equal to the peak value of E_1 minus the small voltage drop across V_2. Tube V_1 now is non-conducting. Capacitors C_1 and C_2 each have a voltage equal to 1.414 x E_1 rms. The no-load output d-c voltage E_4 across the two capacitors in series therefore is 2.82 x E_1 rms.

When V_1 is non-conducting, the peak inverse voltage across this tube is equal to E_2+E_1 peak (i.e., to twice the peak value of E_1). Similarly, when Tube V_2 is non-conducting, the peak

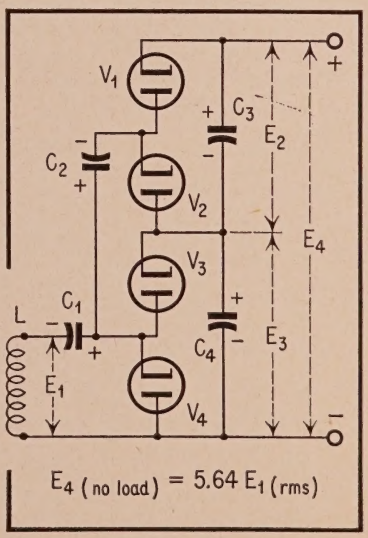


Fig. 11. Voltage Quadrupler.

inverse voltage across this tube is equal to E_3+E_1 peak (i.e., to twice the peak value of E_1). In this circuit, therefore, each capacitor must be able to withstand safely the peak value of the applied a-c voltage, E_1; and each tube must be rated to withstand safely a peak inverse voltage equal to twice the peak value of E_1.

The voltage quadrupler circuit, as shown in Figure 11, is a combination of two voltage doublers. Operation is explained in the following manner: When the lower terminal of Winding L is positive, Diode V_4 conducts, charging Capacitor C_1 to the peak value of the input voltage, E_1, minus the small voltage drop across V_4. During the opposite half-cycle, when the upper terminal of L is positive, the peak value of E_1 is added to the equal voltage across C_1, and Tube V_3 conducts, charging Capacitor C_4 to this voltage sum: $E_3 = 2.82 \times E_1$ rms. The same sequence takes place in the upper portion of the circuit, with C_2, V_1 and V_2 acting to charge Capacitor C_3 to a voltage E_2 equal also to $2.82E_1$ rms. Thus, the no-load d-c output voltage E_4 across Capacitors C_3 and C_4 in series is the sum of E_2 and $E_3 = 5.64 \times E_1$ rms. From this, it is evident that Capacitors C_1 and C_2 must be able to withstand safely the peak value of E_1 (i.e., $1.414 \times E_1$ rms, while C_3 and C_4 each must be rated at $2.82E_1$ rms. Each tube must be rated to handle safely a peak inverse voltage equal to twice the peak value of E_1; that is, to $2.82E_1$ rms.

Peak Voltage Measurement

The most versatile instrument for measuring peak voltages in rectifier circuits is a voltage-calibrated, direct-coupled (d-c) oscilloscope. This instrument has high input resistance to minimize circuit loading and displays simultaneously d-c voltage levels and superimposed ripple waveforms.

Figure 12 shows a typical pattern such as might be obtained when the vertical amplifier input terminals of the d-c oscilloscope are connected across a rectifier tube. The zero reference is set near the top of the screen by means of the vertical beam-centering control. The deflection up to the level +E indicates the low forward voltage drop across the tube in the conducting condition. The large deflection down to the level −E indicates the peak inverse voltage across the tube during the non-conducting half-cycle.

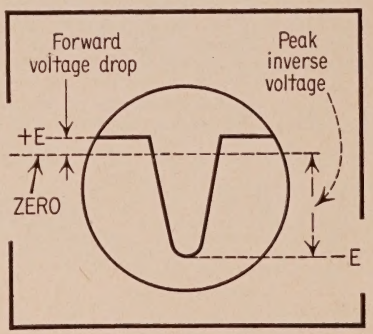
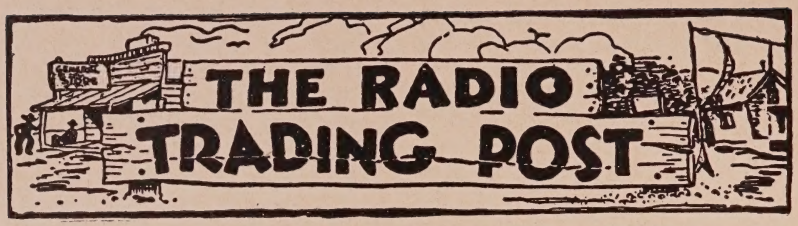


Fig. 12. Typical D-C Oscilloscope Display.

Caution is necessary when using the oscilloscope: Many peak voltage measurements in power supply circuits are made where both test points are above ground. In this instance, the metal case of the oscilloscope might be "hot" by several hundred volts — enough to deliver a dangerous shock to the operator.



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SELL OR TRADE — GI-R85L 3-speed recording assembly, 12 v. dynamotor 480 v. at 42 ma. Ed Roethel, 78-34 79th Ln., Brooklyn 27, N. Y.

SELL OR TRADE — Emerson 609 projection TV in working cond. Need scope, recorder, electric organ. Ralph Savage, 2302 Cadie Ave., Dayton 4, Ohio.

FOR SALE — National Radio & TV Communications course, with all kits & VTVM. Kits alone cost $110. Sell all for $55. W. Davis, 19227 Lemay St., Reseda, Calif.

SELL OR TRADE — Exakta VX, reset Tessar lens and Revere 888 automatic projector for professional tape recorder like Concertone. J. F. Ehrlich, 281 Schaeffer St., Brooklyn, N. Y.

SELL OR TRADE — Collins 75A2, $295; HRO50T, $265 for NC 300. Both l. n. C. G. Addison, 54 Sargent Rd., Swampscott, Mass.

STOLEN — Small tan tube caddy (Mastra); Weller soldering gun; B & K, Superior C.R.T., and Superior TV tube checkers; tubes and tools; black Tele-Tone portable radio with new RCA 117Z3 tube. It offered for sale please notify Newark police or Victor W. Dinella, 227 Cleveland Ave., Harrison, N. J.

FOR SALE — 7" Precise 300 scope, TV-60 allmeter, TV-50 genometer, Esco multimeter and 75 TV and radio tubes, all for $200. Laurence Bertoldo, 2316 Paradise Blvd., Rockford, Ill.

FOR SALE — Blonder-Tongue DA2 TV dist. amp., little used, $15; Regency RC-53 UHF conv., TV, $10, or both for $20. Murphy's TV, Box 103, Osprey, Fla.

FOR SALE — Liquidating shop: Eico VTVM; RF sig. gen. and RC bridge; Heathkit audio gen.; meters; soldering irons; headphones; resistance and capacitor decades; steel parts and cabinet. Marcus H. Moses, 35 Hamilton Place, New York 31, N. Y.

FOR SALE — Viking Adventurer with 3 novice xtals; Heath VFO, Q mult. and preamp. All in good cond. Albert Bliss, 337 New Lots, Brooklyn 7, N. Y.

FOR SALE — Heath 0-10 scope, l. n., $85; Mallory vibrator tester 6VTI, factory wired, l. n., $25; Stancor transformers. F. Berry, 4623 Eventide, Kalamazoo, Mich.

WANTED — 19VP22 color tube. Sell or trade, transistor Regency, and transistor Arvin pocket radios, excellent cond. and reasonable. Elmer Rowekamp, 5701 Grand Ave., Minneapolis 19, Minn.

WANTED — Xtals 3450 kc to 3600 kc FT 243-241 or 171, or what have you? Cecil Van Buren, 439 Bracken St. N., Twin Falls, Idaho.

FOR SALE — Best offer for Precision 954G tube checker and tester, complete instruction sheet. N. A. Cordier, Box 412, Salem, N. Y.

WANTED — Radio control outfit for boat. Will swap movie camera and projector. Robert Camuso, 138 Prospect St., Newark 5, N. J.

FOR SALE — Heathkit TS-4A TV gen., $42.50 and SG-8 RF sig. gen., $16; Supreme TV diagrams 1952 through 1956, $12. All l. n. Prices plus shipping. Lewis M. Owens, Box 384, Columbia, Ky.

SELL OR TRADE — Good radio-TV books; AC45 Thriftlite Stroblite, $25; Turner 22X mike, cartridge 1. n., stand; 50-925 Philco FM-AM radio; 352 PL Arvin 3-way portable. Chester Benson, 333 South 5th, Richmond, Ind.

FOR SALE — Retiring engineer will sell perfect cond. Simpson 260 VOM, RCA jr. WV-77B, C-D capacitor and resistance decades, DC meters, earphones, mike, filament, power, step-up, transformers, TV tuners, tools, etc. Armand Kolkin, 2681 W. Second St., Brooklyn 23, N. Y.

SELL OR SWAP — Riders TV manuals 1 thru 7; also Electronics from 1944 to date. C. E. Hoover, 628 Eighth St., Ames, Iowa.

WANTED — RCA MI-4180 portable turntable; tube data book before 1935; Radio Telegraphy and Telephony by Duncan and Drew, 1931; Rider Vol. 1. State price. Thomas Stern, 4323 Gunther Ave., New York 66, N. Y.

FOR SALE — 2 meter station ARC-5 xmtr. with separate power supplies for HV and LV in 14" x 19" rack panel and Sonar SR-9 rcvr. and plate modulator with separate power suuplies in 8¾" x 19" rack panel incl. spkr. and meter. Sacrifice $150. A. E. Clark, Jr., 44 Lewis Lane, Syosset L. I., N. Y.

SELL OR TRADE — McMurdo-Silver 900 VTVM; Triplett 2432 sig. gen.; Heathkit aural visual sig. tracer, (all with complete instructions); DeForest Radio & TV Servicing course; Supreme manuals. Want VHF aircraft transceiver. James Corson, 200 Glendale, Elkhart, Ind.

FOR SALE — Precision 954 tube and set tester, $65, and E-200-C sig. gen., $35; Heathkit 425 scope, $25; HQ129X communications rcvr., $100. All in very good cond. M. Vassalls, 99 Greenpoint Ave., Brooklyn 22, N. Y.

FOR SALE — Stancor A-3893 poly-pedance modulation trans., wired into xmitter, $8; Thordarson T19F93, 7.5 v CT @ 4 amps. 2000 v insul.,$3; and T19F94, 7.5 v @ 8 amps, 2000 v insul., $3.50. Andrew L. Smith, 24 Lee Court, New Rochelle, N. Y.

SWAP — Ship's chronometer, Hamilton, 23 jewels, double lid oak case, solid brass gimbel assembly. Excellent, $200 value, for standard brand amateur communication rcvr. Alfred L. Isaacson, 3610 Sunnyside Ave., Chicago 25, Ill.

FOR SALE — Riders manuals 7 to 17, all indexes, plus "How It Works," 1. n. cond.; $60 plus freight. Mack Spizer, 6017 Mayflower Ave., Maywood, Calif.

SELL OR TRADE — Heath V-6 VTVM; Emerson 558 pocket portable radio; Keystone camera. A. Schrier, 38 W. 182nd St., New York 53, N. Y.

SELL OR TRADE — Walkie-Talkie chassis BC 611, less batteries, operate on 80 m, band at freq. of 3885 KC. Best offer over $100 or test equip.: scope, sweep or marker gen., UHF converters, etc. F. P. Czaja, 5 Oak St., Meriden, Conn.

WANTED — "C-D Capacitors," May, June, July 1937, June to Dec. 1939, Radio News Aug. Sept. Oct. 1921 and ARRL Handbooks for 1929. Joseph Simpson, 85-39 152 St., Jamaica 32, N. Y.

FOR SALE — Pentron T-90 tape recorder, 1. n., $85; RCA broadcast transcription arm, cartridge and qualizer for lat. and vert. transcriptions, $40; with additional diamond cartridge; Amperite velocity mike, $10; used tape. Victor Maycher, 168 Williams, Hasbrouck Heights, N. J.

FOR SALE — Heath sweep gen.; TV rejuva and pix tube tester; Riders 5 to 10; wire recorder; Standco B-5; Weston 665 selective analyzer. Best offer. E. Cardona, Apeninos 633, Puerto Nuevo, Puerto Rico.

FOR SALE — Complete NRT Radio and TV communications course including lessons, kits, and multitester, $70; DuMont 304 oscillograph, $100. J. Dunn, 2086 Edenwald Ave., Bronx, New York, N. Y.

FOR SALE — Unused Telrex 3 el 20 meter beam, $70; B & W TR switch, $16. Trade in TV sets. C. D. Justis, Newport, Del.

FOR SALE — Recent DeVry Technical Institute Home Basic Electronics and TV servicing course, cost $375, sell for $75 less kits. Milo Flagel, Cashmere, Wash.

WANTED — Sam's folders to fill library. Write stating numbers and price. F. O. Copithorne, 108 Lawrence, Ferguson 21, Mo.

WANTED — 6 or 2 meter gear transmitters, 6 or 2 m converters using either 40 meter IF or 1500 IF. C. Stephens, 3612 39th Ave., Culmar Manor, Md.

FOR SALE — Photofacts folders on Hoffman Packard-Bell TV sets, etc., 60 cents. Will ship collect. Need prof. TV Service course, books, electrical appliance manuals. Modern Electric Sales Service, Marion, Ky.

FOR SALE — Established TV store with living quarters. Near Convention Hall and Boardwalk. Reasonable. F. A. Miranda, 2424 Pacific Ave., Atlantic City, N. J.

FOR SALE — NC300; Viking Ranger; MB-26 two meter xmitter; E400 Precision sweep gen.; 7" TV; 777 Weston tube tester; Meissner analyst. A. Turturro, 146-26 No. Hempstead Tpke., Flushing 55, N. Y.

FOR SALE — Knight 3 tube ocean hopper rcvr, with 6 coils, covers 155 kc. to 35 mc., less cabinet and phones. Used 1 month only $10. George L. Parfitt, 1281 East 111 St., Cleveland 8, Ohio.

WANTED — Espey model 7C chassis only in A-1 cond. John R. Childs, Jr., Box 32, Dahlgren, Va.

WANTED — 8 mm or 16 mm camera and projector good cond. Will swap test equip., photofacts, etc. Sydney M. Shapiro, 2 Thomas St., Whippany, N. J.

FOR SALE — Mobile equipment, Subraco xmitter, Gonset 20 meter convertor, Carter dynamotor. Wallace Printz, 1177 East 14 St., Brooklyn 30, N. Y.

FOR SALE — Hallicrafter S76 rcvr., mint cond., orig. carton and instruction manual, $100 fob; Trav-electric Super inverter, 6 DC to 110 AC, 60 w cont. 75 w int., good cond., 15 fob. H. Slade, 23 Francis Ave., Cambridge 38, Mass.

FOR SALE — Webcor 210-1B tape recorder, $100; Heath AR-3 rcvr., $35; Kodak 35 mm, f.3.5, 105697, w/case, $20. All in good cond., fob. E. L. Stohl, 283 20th Ave., 6, San Francisco 21, Calif.

WANTED — BC348, ART13. Trade SX42 or buy outright. E. Davis, 308 Hickory St., Arlington, N. J.

WANTED — High quality sterio playback, 2 track record tape recorder, 2 to 4 station home intercom; 3 small corner speaker cabinets. Will trade or sell cheap sterio Realist 35 mm camera and mobile gear. Kenneth M. Miller, 14979 La Cumbre Dr., Pacific Palisades, Calif.

WANTED — Mobile rig for 12 v system. Also will trade or sell Heath AT-1 with or without plug in modulator. Lawrence L. Lewis, Aberdeen, Idaho.

TRADE OR SELL — Webster wire recorder, needs repair; Bendix MRT3 mobile FM transceiver 157.53 mc. L. D. Cinci, 204 Charter St., Clarksburg, W. Va.

FOR SALE — 10 KVA alternator, 110-220 v., 1 phase, 60 cycle, 1200 rpm, separately excited, revolving field type, $95 including exciter. Frank Dunigan, Park Ave., Toms River, N. J.

WANTED — Precision tube tester as 920 or 912, state cond., model, and lowest price. Jm Wong, 200 8th St., W. Huntsville, Ala.

FOR SALE — Heathkit AR2 rcvr., $20; 12 816 tubes, $18; 1. n. dymo. 28 imput 1000 output at 350 amp. George Colacicco, Rt. 3, Box 400-D, White Rd., San Jose, Calif.

FOR SALE — 16 mm movie reels and cans; GE exciter lamps, Paymaster Deluxe checkwriter, 1. n., $65. G. D. Griffin, 322 West State St., Apt. 1, Ithaca, N. Y.

FOR SALE — Webster record changer, $10; parts and coils for Meissner communication rcvr., $10; disc record magnetic head mechanisim, $15; x ray machine. Plus postage. William R. Holleran, 323 Garland St., Pittsburgh 18, Pa.

FOR SALE— Mc Intosh Hi-Fi amplifier 50W-2 amplifier and power supply, perfect, cost $250, converting to sterio. R. N. Brunt, 61 S. Spring St., Elizabeth 4, N. J.

FOR SALE — Century 103 CRT testivator and Eico 950B condenser resistor checker. Both perfect, $32. Want scope. Manuel Hernandez, 148 South 8 St., Brooklyn 11, N. Y.

WANTED — Manual or information on E. H. Scott SLR-F radio receiver, serial No. 2212. Will pay any reasonable price. Steven Huddle, 11952 Bayla St., Norwalk, Calif.

FOR SALE — RCA Radiola 26, antique portable; fifth edition ARRL Handbook and several of Riders first editions, all new cond.; Weston meters; Amprobe 300 meter, excellent cond. M. Mandel, 1475 Popham Ave., New York 53, N. Y.

FOR SALE — Xmitting parts, meters, capacitors, transformers. Stan La Dage, 431 Oakland Ave., Maple Shade, N. J.

FOR SALE — Sam's Photofacts 100-355, $200. West Pine TV Service, 95 West Pine St., Gloversville, N. Y.

WANTED — Small radio in good cond. for man or woman's fine wrist watch. Levriett, 816 Broxton, Jacksonville, Fla.

FOR SALE — NC 183D with matching speaker. Used less than 50 hours, $325; 2 Bud enclosed relay racks, 10½" and 3-8 ¾" panels. Sacrifice for $25. G. B. Kirk, 2315 Iota Ave., Cuyahoga Falls, Ohio.

WANTED — Precision test equipment: E 200C, E 400, ES 550, 98 MCP, 612 MCP, SP 5. Send best price first letter. T. A. Bergman, H. A. Lorenzstraat 84, Den Helder, The Netherlands

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SELL OR TRADE — Radio Electronics mag., 1954, 55, 56. A-1 cond; GE 14" TV CH 14C102, working cond. No cabinet. No reasonable offer refused. William Lindquist, Apt. 4B, 2800 86th St., Brooklyn 23, N. Y.

SWAP — FR enlarger, spear gun, fins, mask and rubber skin diving suit for Hallicrafters S-53A or equal rcvr. Ken Strum, 2845 W. 30 St., Brooklyn 24, N. Y.

WANTED — World's (N.Y.) Fair books, etc., Hi-Fi player, old tubes, U.S. precancels in good cond. Have tech books, stamp catalogs, CQ mags, old records. Harry Kuell, 18½ Thomas St., Newark 5, N. J.

WANTED — Popular Electronics Oct. 1956. Trying to contact builder of "How to Build a Dry Battery Rejuvenator," Page 47. Max H. Cohen, Box 43, Arverne 92, N. Y.

WANTED — Good case including back cover for Garod 4A1B portable radio. Give price. Wilbur Remley, R 6, Box 370, Decatur, Ill.

SELL OR TRADE — Kodak bantam RF camera, case, flash and Weston master meter. All l. n. Need 39.98 mc FM rcvr. or what have you? Al Werhan, Manlius, N. Y.

WANTED — RCA Picto-Guide. Milton Leiser, 305 E. Mt. Eden Ave., New York 57, N. Y.

WANTED — Eico RC bridge any cond. for cash. Will sell appliance tester, $4; transistor tester, $6; RCP VTVM, $20. All postpaid. J. Leach, Box 336, Milton, Del.

WANTED — Radio noise filters, list manufacturer, type, current, voltage ratings and lowest prices. J. and A. Electronics, Box 558, New Bedford, Mass.

FOR SALE — Viking II & VFO factory wired, $225; RME DB23, $35; Hallicrafter SP44 panadapter, $50; Tecraft two meter conv., $25. Mark Grossman, 1665 Monroe Ave., Bronx 57, N. Y.

FOR SALE — McMurdo-Silver 911 sweep gen., $35; Eico 221 VTVM, $20; 5" scope, $45; Precision gen E-200C, $35; Motorola 160 6 v batt. eliminator, $10; Weston 772 multimeter, $20. Andy Bagatta, 180 Central Ave., Brooklyn 21, N. Y.

FOR SALE — SCR-522, 625 BC transmitter with tubes $10; Brown strip chart recorder, $35; 2 Sola 120 v 110-110 v CV transformers, $5 each. A. J. Talbot, 2334 First Ave., N.E., Atlanta 17, Ga.

FOR SALE — Perfect Hickok five inch scope and frequency modulator, model 505A, $200. Paul Capito, 637 W. 21 St., Erie, Pa.

FOR SALE — Double conversion ham receiver, perfect condition. Consists of AR-3, cabinet, Q multiplier, Q5er (5 tube IF strip), and sharp CW amplifier, $55, also WAP1 pre amp. Peter Levine, 3388 Wayne Ave., New York 67, N. Y.

NEED — Diagram or information on CRV 35093 part of Mar equipment; also spare parts for BC348. Walter Koziara, 2137 Cortelyou Rd., Brooklyn, N. Y.

SELLING OUT — Brush soundmirror tape recorder BK-401 complete with mic. inst., manual incl., exc. cond., $90; Garrard changer RC60, GE rel. cart., 78 rpm, inst. manual incl., exc. cond., $19; record library, etc. Vincent Pellettieri, 5523 31 Ave., Woodside 77, L. I., N. Y.

FOR SALE — Factory calibrated Eldico grid dip oscillator, $20; transmitting and receiving tubes including 813, 6146, 4D22 6L6; home built VFO, $15 and wavemeter, $5. Local preferred. David Barlin, 257 Red Maple Dr., Levittown, N. Y.

WANTED — Used Radio & TV course less kits also a good up to date tube tester; must be priced reasonable. Virgil Kramer, Burwell, Neb.

FOR SALE — Perfect Eico 425 5" push-pull oscilloscope, completely wired and assembled, $45. Edwar F. MaHoney, Jr., 19 Pine St., Woburn, Mass.

FOR SALE — FM rcvrs. 30-50 mcs, less tubes and power guaranteed, $25; 300-700 mcs Lavoie freq. meter, $35; 152 mc transmitter, $35; Wanted: Lampkin freq. meter; instr. book for BC639/RA42; RG-59U coax. Higley, 82 Lower Main St., Matawan, N. J.

WANTED — Tone chamber for Hammond organ JR20-HR40 or Leslies. Have cash, Hickok test equipment, cameras, "S" gauge railroad and equipment. Edward Sujak, 2526 So. 58 Court, Cicero 50, Ill.

FOR SALE — AT-1 transmitter, $35; 6146 in final 35-40 w; ARC-5 transmitter, $20; VFO-40 meters 70 w. Both in A-1 cond. Tex Birnholz, 634 High St., Newark 2, N. J.

WANTED — Sam's manuals in used cond. as long as folders are complete. State numbers you have for sale or trade. Wood Radio & Television Service, 213 Springer Dr., Coraopolis, Pa.

FOR SALE — Perfect Mohawk pocket size tape recorder, for $175 or best offer. Pvt. Witmer, RA13606948, Hq Co USATCA G4, Fort Knox, Ky.

SELL OR SWAP — McMurdo-Silver 909 sweep gen.; Eico 315 deluxe gen.; incircuit condenser tester; EMC-104; VOM; Weston ammeter and volt meter. Want good reflex camera, tape recorder, small scope, Hi-Fi equipment. Control TV, 123 Ave. U, Brooklyn, N. Y.

SWAP — Electronic equipment for 22" rifle with scope or revolver. Thomas Elwood, 22 Butler Pl., Rosebank 5, Staten Island, N. Y.

WANTED — Standard enclosed relay rack with over 36" of panel space. Prefer black but gray will do. Paul Bittner, 316 N. 13th St., Springfield, Ill.

SELL OR SWAP — NRI VTVM with leads and high voltage probe, l. n., $40 or what have you? Brian Chin, 22 Mulberry St., New York 13, N. Y.

WANTED — Four-panel rack, suitable for final, with or without panels, 19" or telephone width, prefer one unassembled. Harold MacDonald, Kodiak, Alaska.

FOR SALE — Radio & TV service books, mostly cloth bound and printed since 1950. Send stamped, addressed envelope for list. Joe Wunderlich, 969 E. North St., Galesburg, Ill.

WANTED — Correspondence course in Radio-TV repair. Must be recent and complete. William Penn, 18 Pomander Walk, New York 25, N. Y.

WANTED — Tubes and other electronic equipment for cash or swap. In good to new cond. Send list and asking prices. Sy Denby, 78 Cortland St., New York 7, N. Y.

FOR SALE — Ham Station with less than 150 hours operation. B and W 5100 transmitter and spare final tubes. HRO-60 rcvr. with speaker, crystal calibrator, and 7 coils: A, B, C, D, E, F, and AD. Both for $595. John Donnelly, 330 31st St., Hermosa Beach, Calif.

SELL OR SWAP — Transmitting tubes, transformers, condensers, chokes, test equip., etc. Want tape recorder, coax relays, etc. R. Rosellini, 2619 So. Gaylord, Denver 10, Colo.

SWAP — Simpson meter 260, misc. meters Weston, Simpson. U. S. mint plate blox. Want Poloroid camera, 8 mm movie projector, comm. rcvr., etc. P. Gersh, 150-10 71st Ave., Flushing 67, N. Y.

FOR SALE — Fisher FM-80 tuner with blonde cabinet, half price, $75 postpaid and insured; Audax 16" transcription arm with GE 052 and Pickering S-240D cartridge, $25. All in A-1 cond. Charles Leigh, 162 Passaic St., Trenton 8, N. J.

FOR SALE — Regency RC-600 UHF converter in original carton with complete instructions and schematic. Sacrifice for $10 plus postage. Austin B. Wardman, 106 Rossmore St., East Pittsburgh, Pa.

FOR SALE — 5" Heathkit 0-8 scope new CRT complete with probes, $25. Murray's TV, 62 Front St., Addison, N. Y.

FOR SALE — Electrovoice 636 hi/low impedance dynamic microphone, new cond., with leather case, $25. M. G. Weiman, 4514 Avenue K, Brooklyn 34, N. Y.

WANTED — for cash: No. 82 tubes. State how many and price. Carl D. Miller, 1109 Fairview Pl., Bismarck, N. Dak.

FOR SALE — Type 263A 8 tube Lafayette amplifier, 2 inputs with separate controls; 2 Jensen concert speakers, 12" 14 w, with extension cables, $25 for all, plus shipping. Frederick R. Shutt, 612 Frantz Ave., Mullens, W. Va.

FOR SALE — Unused RCA 17CP4A picture tube with polyethylene jacket, $15 fob Philadelphia; conversion kit for use with small screen size sets. W. L. Van Horne, 49 Johns Rd., Cheltenham, Pa.

FOR RENT — One man Radio Shop with living quarters in Southern California for semi-retired technician. 75 mi. from LA and San Diego. Radio, R 1, Box 76, Elsinore, Calif.

WANTED — Instructon manual for McMurdo-Silver improved model 905 "SPARX" sig. tracer gain test set. Must be in good cond. and contain schematic. August A. Forss, 89 Cedar St., Pawtucket, R. I.

FOR SALE — KW phone transmitter: 3 primary keyed HV power supplies, 12 meters, butterfly condenser in final, link coupling, Miller exciter, D-104 mike, tubes, coils and xtals. You pickup for $450. F. Sampson, 914 Middlesex Ave., Metuchen, N. J.

SELL OR SWAP — Perfect Rigoletto electric organette, over three octaves, carries like suitcase. Cost $150. Want good tape recorder. Will also give cash in addition to Organette if tape recorder warrants it. Dan Bruno, 28 S. Bow St., Milford, Mass.

TRADE OR SWAP — Guitar, violin, accordion and amplifier for good radio, TV, or tape recorder. Ray Green, Box 50, Milford, Mass.

WANTED — Tubes: All types including TV, receiving, transmitting, etc., test and communications equipment. Surplus accepted. Send list and details for cash or swap. Lou Dolin, 172 Washington St., New York 7, N. Y.

SELLING OUT — Precision: E200 $45; E-400, $75; 954 tube checker, $45; EV-10S with probe RF, $65; Simpson: 260 $35; 269 VOM, $59.50; Hickok 288X, $95; E-D VTVM, $25. John Pellock, Benld, Ill.

WANTED — Discarded TV and radio sets for home course vocational rehabilitation study. Raymond Olson, Kindred, N. Dak.

FOR SALE — 7 variable condensers good as new. Make offer. Michael A. Barone, 2113 Beech Grove Pl., Utica, N. Y.

WANTED — Two rotor control boxes and one tuning meter for Alliance D1R TV rotor. Alan York, 35 Main St., East Hampton, N. Y.

FOR SALE — Heath CT-1 in circuit capacitor tester, $6.00 cod. Redd's Radio and TV Service, Box 12, Union Furnace, Ohio

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FOR SALE — Hallicrafters S-36 radio receiving set, freq. range 27.8 to 143 mc. $125 FOB. Emil Backstrom, Jr., 5235 N. Winthrop Ave., Chicago 40. Ill.

SWAP — Triplett 630 multi-meter, perfect, $20 cash plus $15 net of standard, unused tubes of my choice. C. Elgasser, 1920 Fern St., San Diego 2, Calif.

FOR SALE — 24 VAC filament xformer for ARC-5's shielded, $1.50. Want Gonset super 6; Heath TS-4 and T-3. Norman Inventasch, 320 E. 176 St., New York 57, N. Y.

SELLING OUT — Resistors capacitors, Erie ceramacon capacitors, National SW-54 shortwave rcvr., l. n., $35; Premier Lab RF sig. gen., l. n. cond., sacrifice for $40. Herbert Piller, 451 Thieriot Ave., Bronx 72, N. Y.

FOR SALE — Gonset 500-W linear amp, $225; C. E. 20 A SSB exciter, $200 and BC 458 VFO kit, wired, $39; Elma 67 all-bandswitching mobile transmitter, $140; Sonar MR3 80-40-20 mtr. rcvr. complete, $39. A. R. Dayes, 29 Charles St., Merrick, L. I., N. Y.

WANTED — Outdoor speakers, FM rcvr. 152-162; Citizens Walkie Talkie; Mike; tube tester; AM-FM tuner. S. Krzak, 65 Main St., Pawtucket, R. I.

WANTED — Metal locator or mine detector. Can be surplus, kit, or commercial. Any condition. H. F. Bates, 10 Beaver Dam Rd., Scituate Harbor, Mass.

SWAP — Tape recorder for automatic Rolleiflex F3.5 Tessar plus extras. P. R. Sable, 39-40 Greenpoint Ave., Long Island City 4, N. Y.

SELL OR TRADE — RCA WV 98A, $50; Simpson 355, $20; Bell RC47A disc recorder, $40. Want good typewriter. Must be in Metropolitan N. Y. area. E. De Santis, 69 Webster Ave., Jersey City 7, N. J.

WANTED — 250/300 w. modulation transformer; 1A and 7.5A or larger Variacs; 500 ma. chokes; Boy Scout Pedometer. D. M. Frantz, 7056 Noble Court, Cincinnati 39, Ohio.

FOR SALE — Hallicrafter S-40-A, perfect, clean, $65. No shipping. Joe Coffield, 1731 W. First St., Brooklyn, N. Y.

SELL OR TRADE — 5" De Vry scope & VTVM both for $75, or trade for Heathkit W-5 Hi-Fi amplifier kit. William Planzo, 371 Columbus Ave., Springfield 5, Mass.

TRADE OR SELL — RME DB-23 preselector for good Johnson Viking matchbox. Earl Hoskinson, 1404 Grove Ave., Corning, Iowa.

WANTED — 3" Heathkit scope. State price and cond. C. A. Currier, 1531 Belmont St., Manchester, N. H.

WANTED — For cash or trade radio meters or tubes. M. J. Douglas, 1401 Amador, Concord, Calif.

WANTED — Used broadcast quality tape recorder. Submit make, model, age, general cond., and price. Downtown Church of the Nazarene, 4100 N. Robertson St., New Orleans 17, La.

WANTED — Thesaurus and E.R.P.I. transcriptions by Xavier Cugat and Harry Horlick Orchestras. Have Jensen 15" co-axial speaker and Klipsch Rebel 5 cabinet. Sam Kiamie, 930 Grant Ave., Pelham Manor, N. Y.

SELL NO SWAP — WRL 275 w. Globe King; coils for 10-15-20-40-80 de TVI'd. Pick up, $175; ship fob, $190. WRL 755 VFO, $35; Rolleicord IV, case, $90; Kodak Signet case, $50. Want D104 with push-to-talk. Clark, Frances Dr., Greenwood Hills, Harrisburg, Pa.

WILL SWAP — sheet metal brake 24" (150 lb.) for radio or photographic equip. BC-348 with S meter and AC power supply, $40. Send for list of amateur equip. Al Waring, Box 483, Lake Ronkonkoma, L. I., N. Y.

FOR SALE — Approved AM-FM 12 tube tuner, excellent cond., $25. F. W. Preeshl, 76 Prospect Blvd., St. Paul 7, Minn.

WANTED — Eico 625 tube tester or similar make, reasonable; Sams Photofact binders. Kenneth Miller, 10027 Calvin St., Pittsburgh 35, Pa.

FOR SALE — GE 640 portable 3-way radio, $25; 16 mm 100 ft rolls Ansco B & W film - ASA50 (hypan) $1.40, less processing. Guaranteed. "Cas" 8561 66th Rd., Forest Hills 74, L. I., N. Y.

WANTED — Minifone midget recorder in good used cond. for cash. John O. Hehn, 18 S. Jardin St., Shenandoah, Pa.

FOR SALE — Heathkit T-1 sig. tracer, and Eico 221 VTVM, both in good cond., $25 for both. Harry Steinberg, 2200 Tiebout Ave., New York 57, N. Y.

WANTED — Alternators, complete, 6 v., must be in good cond.; also rcvrs. to tune 450-470 mc FM. State price, cond. of both. Associated TV Service, 1822-1823 24th St., Sacramento 16, Calif.

FOR SALE — RCA 66A modulation monitor, perfect working cond., $125 fob or best offer. Harry M. Boone, 200 Brightside Ave., Pikesville 8, Md.

WANTED — 16 mm sound film to buy or swap for radio gear or tubes. W. L. Rust, Box 155, Etna, N. Y.

WANTED — Citizens band transmitter and receiver. Al Budin, 10749 Superior Ave., Cleveland 6, Ohio.

FOR SALE — Simpson 260, $30; 383 cond checker, $45; E-D VTVM, $25; Hickok 288X, $85; Precision E-200, $45 and E-400, $90; Super-pro rcvr., $75. Scott Radio-TV, 8643 Jennings, St. Louis 21, Mo.

SELL OR SWAP — 300 w. AC 110 or 220 v. light plant, 1. n.; Meissner analyst, complete with prods. Swap either or all for good tape recorder. Fred W. Rudolph, Stryker, Ohio.

WANTED — Revere T-700D or TR-800D tape recorder. Eugene Kon, 1516 Broadway, Buffalo 12, N. Y.

WANTED — Manual for BC 779 Hammarlund radio. Vernon Slavik, 511 5th St. N.E., Montgomery, Minn.

SELL OR SWAP — Used 16GP4 pix tube, 12" Emerson table cab.; Fada FM tuner. Want Heathscope 0-10 or 0-11, sweep and sig. gens. J. K. Smart, 626 Evans St., Newark, Ohio.

FOR SALE — 12SK7 tubes, 3 for $1; 4 x 4 x 2 metal utility cabinets with covers, 50c each; 5" plastic tape recording reels, 25c each plus postage; misc. parts. E. Weibert, R 3, Box 434A, West Palm Beach, Fla.

FOR SALE — 2 dynamotors or genemotors, 6 & 12 v., you name price. Selling out tubes. Send for list. Wilham Rorb, 3064 A St., Philadelphia, Pa.

TRADE OR SELL — BC-639 rcvr., approved fs meter A-460; Dumont 274 scope; Sentinel 7" portable; unused RCA 36-A color bar-dot bar gen., all cables, manual, etc. Want A-1 ham rcvr. G. E. Howarth, 261 First Ave. East, Oskaloosa, Iowa.

FOR SALE — Model 10B sensi-meter, $75. Used only twice. George Yuncker, 5990 E. Sprague Rd., Cleveland 31, Ohio.

TRADE — BC-348R (AM, CW, SSB) for good S-40A, S-40, or SX24. D. C. L'Hommedieu, 17 Cady Ave, Nichols, N. Y.

SELL OR TRADE — Unused 600D Electro-Voice hand held dynamic mike, exc. for mobile, value $26. Want portable single-play 3-speed record player. G. Demaris, WINK TV, Ft. Myers, Fla.

WANTED — To buy or rent instruction manual for CF Solar Capacity Exameter. E. D. Counsellor, 9 Harrison Ave., Millville, N. J.

WANTED — RCA tuner KRK 12, or junk RCA TV set with this type of tuner. M. E. Schultz, 354 Niagara St., North Tonawanda, N. Y.

WANTED — Hallicrafters SX 28-A rcvr. R. Landman, 67-10 108 St., Forest Hills 75, N. Y.

WANTED — Mirror scale meters, Speed Graphic camera, H.V. condensers. Will trade or pay cash. Harold Pallatz, R. 1, Flemington, N. J.

WANTED — Good all-wave rcvr. and transmitter. State price and model. Edward F. Harrold, 4300 Howland St., Philadelphia 24, Pa.

FOR SALE — Heath SG-7 sig. gen. in excellent cond., $15 prepaid. Bob Nelson, Box 425, Dassel, Minn.

FOR SALE — Hallicrafters S-40B, perfect cond., $75. Want Simpson 120 tester. J. R. McMinn, 1830 Poplar Ave., Memphis 4, Tenn.

WANTED — Auto Radio from 1949 to 1957. Send listing. DeMarco Radio-TV Shop, 193 Pine St., New Haven 13, Conn.

SWAP — Musical Theremin, built from article in April, '55 Popular Electronics. Material, all new, cost $50. Want tape recorder, 5 or 6 transistor radio, or AM-FM table radio. Robert English, 875 Grafton Rd., Newark, Ohio.

SELL OR SWAP — Plymouth '55-'56 radio; also '57 Ford bar tuning deluxe radio. R. Sebul Durk, 9991 Albion Rd., North Royalton 33, Ohio.

SWAP — Complete CREI Practical Radio Engineering course for good transmitter or communications rcvr. George Q. Sessions, 214 Keith Circle, Williston, S. C.

TRADE — Radio tubes for Hallicrafter S-38; scope, 3-way portable, or other tubes. G. H. Swiska, 109 E. School St., Woonsocket, R. I.

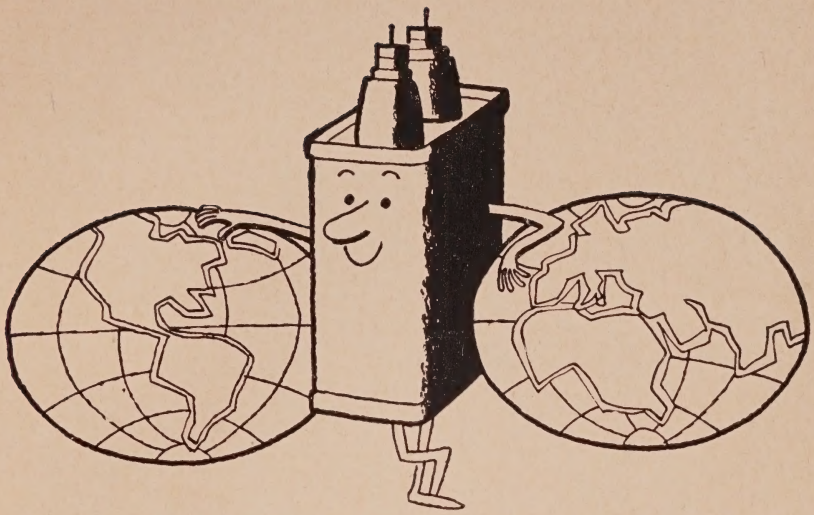
FOR SALE — Hickok 534 tube tester, has multi-meter panel, $75. c.o.d. insured. R. N. La Plante, 827 Gross Court, Green Bay, Wis.

WANTED — FM 30-50 mc UV 199 tubes. Civil War items, old airplane photos, wireless books. Have Keystone 40 stereoscope, also views, C-D mags, movie screen, records. Harry Kuell, 18½ Thomas St., Newark 5, N. J.

SELL OR SWAP — Precise 300B scope, needs minor repair, year old, $80, or swap for good all-band short wave rcvr or hi-fi parts. C. Franke, 15 Cherry Lane, West Haven, Conn.

SELL OR TRADE — Hallicrafters S53; frequency meter 110 v. 56-64 c. Need 30-50 mc FM rcvr. and sig. gen. Francis Hillibush, R 1, Ringtown, Pa.

FOR SALE — Type 2Q4 B & W 350 phase shift network, 6 mtr., 65 w. transmitter. Ernest Wolitzer, 2143-82 St., Brooklyn 14, N. Y.



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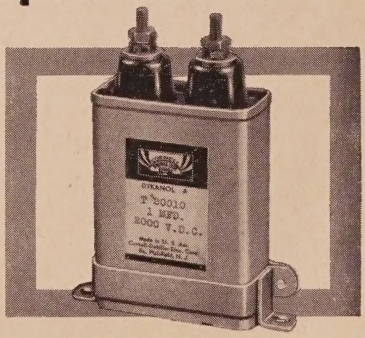

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